Shiells, K., Holmerova, I., Steffl, M., & Stepankova, O. (2019). Electronic patient records as a tool to facilitate care provision in nursing homes: an integrative review. *Informatics for Health and Social Care*, *44*(3), 262-277. https://doi.org/10.1080/17538157.2018.1496091

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Informatics for Health and Social Care

ISSN: 1753-8157 (Print) 1753-8165 (Online) Journal homepage: https://www.tandfonline.com/loi/imif20

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To cite this article: Kate Shiells, Iva Holmerova, Michal Steffl & Olga Stepankova (2018): Electronic patient records as a tool to facilitate care provision in nursing homes: an integrative review, Informatics for Health and Social Care, DOI: 10.1080/17538157.2018.1496091

To link to this article: https://doi.org/10.1080/17538157.2018.1496091

Published online: 20 Aug 2018.

INFORMATICS FOR HEALTH & SOCIAL CARE
https://doi.org/10.1080/17538157.2018.1496091

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Electronic patient records as a tool to facilitate care provision in nursing homes: an integrative review

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ABSTRACT

Objective: The electronic patient record (EPR) has been introduced into nursing homes with the aim of reducing time spent on documentation, improving documentation quality and increasing transferability of information, all of which should facilitate care provision. However, previous research has shown that EPR may be creating new burdens for staff. The purpose of this literature review is to explore how EPR is facilitating or hindering care provision in nursing homes.

Methods: An integrative literature review was carried out using four electronic databases to search for relevant articles. After screening, 22 articles were included for thematic synthesis.

Results: Thematic synthesis resulted in six analytical themes linked to care provision: time for direct care; accountability; assessment and care planning; exchange of information; risk awareness; and person-centered care.

Conclusion: For EPR to facilitate care provision in nursing homes, consideration should be given to the type of device used for documentation, as well as the types of applications, the functionality, content, and structure of EPR. Further research exploring the experiences of end users is required to identify the optimal characteristics of an EPR system specifically for use in nursing homes.

KEYWORDS

Dementia care; electronic health record; electronic patient record; long-term care; nursing home

Introduction

In recent decades, a change in demographic trends in Europe has led to an increasingly aging population.[1] Consequently, there has been a rise in the number of people being diagnosed with non-communicable diseases, such as dementia, which has placed new demands on the long-term care sector.[2] An effective response to the challenge of delivering healthcare to an aging population may incorporate the introduction and utilization of appropriate technology,[3–5] and the electronic patient record (EPR) is one technological solution that has been identified as potentially beneficial for facilitating the provision of care in a nursing home environment.[6–8]

Healthcare today has been described as "information-intensive."[9] Consequently, completing documentation has become one of the most time-consuming activities for staff, meaning that they spend less time on delivering direct care.[10] Furthermore, traditional, paper-based documentation is often inconsistent, incomplete, and illegible,[11] as well as out-of-date and difficult to update.[12] As a result, there is an increase in the possibility for errors and a reduction in the quality of care.[13]

In nursing homes, EPR systems may be used to record various nursing processes, such as assessment and care planning, and to write daily progress notes and handover forms.[14] Potential benefits associated with using EPR include the effective management of chronic conditions,[15] the collection of longitudinal

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information,[8] and the ability to rapidly access information securely.[8] Consequently, EPR may assist staff to deliver a more person-centered approach to care.[16] Furthermore, the increased legibility and accuracy associated with electronic documentation should result in a reduction in data errors and improve standards of care.[17] EPR also has the potential to lead to greater transferability of information across multiple stakeholders,[17] allowing for a more integrated approach to care provision.[18] Finally, EPR has also been associated with raising the "social standing of care work."[16]

Despite the potential benefits, the uptake of EPR in nursing homes has varied considerably across countries, with much of the literature referring to a "technology lag."[16,19,20] Furthermore, a previous systematic review of six studies exploring staff experiences with IT implementation in nursing homes found that the introduction of IT for documentation purposes may bring both benefits and burdens.[21] Consequently, there have been calls to expand research to further examine the impact that electronic documentation systems have on working practices in nursing homes.[9,15,22] Therefore, this literature review aims to add to existing knowledge in the field by exploring the impact of electronic documentation systems on the provision of care in nursing homes.

Method

Study design

The following literature review takes an integrative approach, synthesizing evidence from both quantitative and qualitative studies. Although integrative reviews allow for the "inclusion of diverse methodologies," they have been criticized for their lack of methodological rigor and bias.[23] Therefore, Whittemore and Knafl suggest a specific framework for carrying out integrative reviews, influenced by the model developed by Cooper[24] for conducting systematic reviews and meta-analyses. This framework is used below to describe the process of data collection, analysis, and synthesis.

Search strategy

Various terms can be found in the literature to refer to technology used to record patient data digitally, which are often used interchangeably.[25] For example, in their systematic review, Häyrinen et al.[26] found the following common terms: electronic health records (EHR), EPR, and electronic medical records (EMR). The terms EPR and EMR have the same meaning, with EPR more commonly seen in the United Kingdom, and EMR used in the United States. An EPR or EMR is defined as an application that is "composed of the clinical data repository, clinical decision support, controlled medical vocabulary, order entry, computerized provider order entry, pharmacy, and clinical documentation applications" and refers to information collected from one organization.[25] Whereas an EHR refers to a broader application, which brings together longitudinal data from an individual's various EPRs from different healthcare organizations.[25]

Likewise, the terms nursing home and long-term care are often considered synonymous. In the United Kingdom, introduced in response to "public policy designed to minimise the use of acute hospitals,"[27] nursing homes address the more complex medical needs of individuals, including personal care needs.[2] The World Health Organization defines long-term care as "the system of activities undertaken by informal caregivers and/or professionals to ensure that a person who is not fully capable of self-care can maintain the highest possible quality of life."[28] One "apparatus" of long-term care is "care in an institutional setting," such as a nursing home.[2]

In order to obtain as many relevant results as possible, the terms "electronic medical records," "electronic patient records," "electronic health records," as well as the more general term "electronic documentation," have been combined with the terms "nursing home" and "long-term care." Four databases were used to search for articles. Table 1 shows the exact search string used for each database, along with the number of articles that resulted from the searches.

The following criteria were subsequently used to select appropriate articles:

Table 1. Search strings employed to identify articles.

Database	Search terms	Number of records identified through searching
PubMed	("long-term care"[All Fields] OR "nursing home*"[All Fields]) AND ((("electronic medical records"[Title] OR "electronic patient records"[Title]) OR "electronic health records"[Title]) OR "electronic documentation"[Title])	24
Scopus	(TITLE-ABS-KEY ("long-term care") OR TITLE-ABS-KEY ("nursing home*") AND TITLE ("electronic medical records") OR TITLE ("electronic patient records") OR TITLE ("electronic health records") OR TITLE ("electronic documentation"))	76
CINAHL	("long-term care" OR "nursing home*") AND (TI "electronic patient records" OR TI "electronic health records" OR TI "electronic medical records" OR TI "electronic documentation")	14
ScienceDirect	TITLE("electronic medical records" OR "electronic patient records" OR "electronic health records" OR "electronic documentation") and TITLE-ABSTR-KEY("long-term care" OR "nursing home*")	11
Total number of records identified		125

Inclusion criteria

- Published between 2000 and 2017.
- Published in English or French.
- Original qualitative or quantitative research.
- Conducted in a nursing home or long-term care setting.
- Research into any type of electronic documentation system used for the purposes of care planning, assessment, records or reports and forms.

Exclusion criteria

- Articles published before 2000.
- Articles not in English or French.
- Systematic reviews, meta-analyses, or integrative reviews.
- Studies carried out in residential homes, hospitals, or in the community. (Some studies compared the use of electronic documentation across a range of nursing environments, such as hospitals and nursing homes. If data from nursing homes could not be extracted, these studies were also rejected.)
- Studies that looked only at electronic documentation for medication administration.
- Duplicated articles.

The primary search was conducted manually by the first author. A second author conducted a subsequent search of the databases and found no new additional articles. Full texts were then screened using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines[29] as shown in Figure 1.

Data analysis

Thematic synthesis was used as a method of data analysis.[30] Both the results and discussion sections of the 22 articles were coded inductively by hand line by line, which presented emerging themes across the literature. This process was carried out until saturation of themes was reached. Similarities across themes were then searched for and several were merged and renamed leaving 10. The final stage of thematic synthesis, "generating analytical themes,"[30] involved synthesizing these 10 existing themes in order to address the research question directly, leaving the following 6 analytical themes: time for direct care, accountability, assessment and care planning, exchange of information, risk awareness, and person-centered care. Table 2 summarizes the articles used for thematic synthesis.

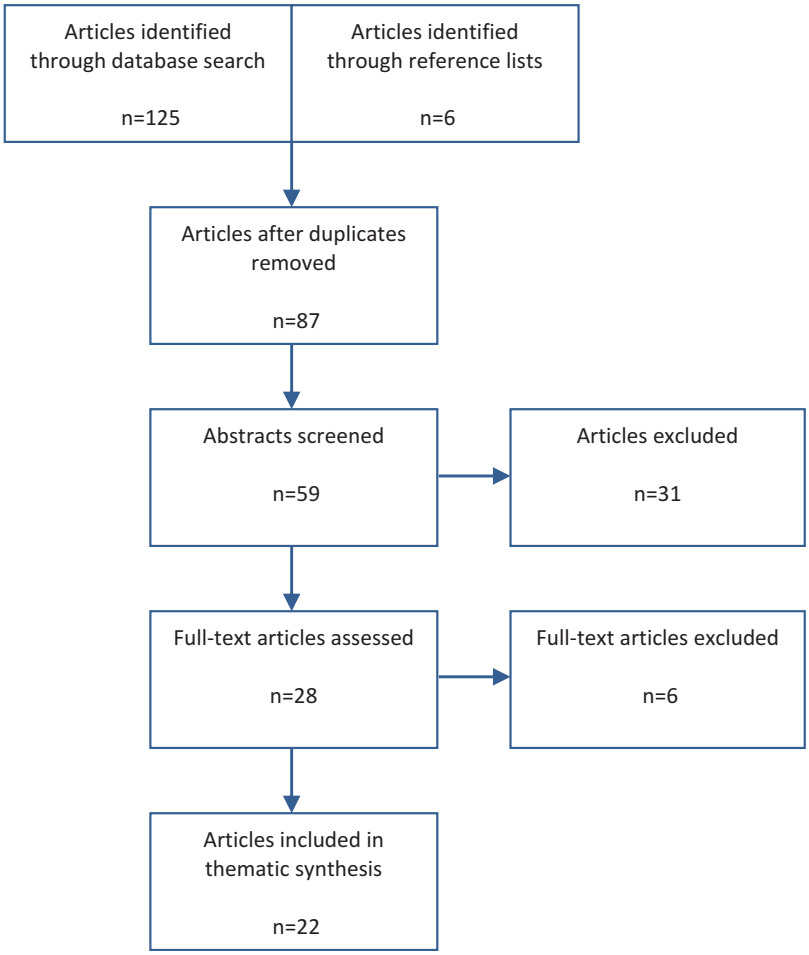

Figure 1. PRISMA flowchart showing search strategy.

Results

Time for direct care

A number of studies reported that the introduction of an electronic documentation system allowed staff to spend less time on documentation, meaning that they had more time for direct care.[5,19,31–33] Staff find using a computer for documentation faster than filling out forms by hand. Furthermore, staff can quickly move from one resident's record to another, and multiple staff members are able to access records at the same time.[32] The processes of data distribution, storage, and retrieval were also described as more efficient,[5,19,31,32,34–36] and the presence of a spellcheck saves time on proofreading.[37] Moreover, increased legibility has meant that staff are no longer forced to call doctors to clarify information that was previously handwritten, often causing time delays.[35]

Florczak et al.[33] found that portable, handheld devices increased efficiency as they enabled staff to access and record data at the point of care. However, in a separate study, some staff felt that bedside technology was time-consuming, and as a result, they were found to be documenting at the end of their shift, and some documenting before care had been provided.[38] In several other studies, it was also suggested that electronic documentation systems do not necessarily save staff time[19,22,36,38] for reasons such as slow log-in processes,[9,14] difficulties with updating passwords,[35] and having to access

Table 2. Summary of articles used for thematic synthesis.

Authors, date, country	Aims	Study design and methods	Sample size	Results
Alexander (2007) United States	To assess the frequency of active alerts in two nursing homes implementing an EHR with CDSS, and to explore the documented clinical responses of care staff when alerts are active and not active.	Comparative study. Collection of de-identified data from residents' EHRs.	Analysis of 118 alerts from two nursing homes.	Active alerts did not lead to significant changes in the documentation of clinical responses in most categories of documentation, with the exception of turning charts.
Cherry et al. (2008) United States	To gain information about long-term care leaders' general understanding about EHRs, and identify factors that facilitate and hinder implementation of EHRs in long-term care facilities.	Exploratory study. Focus groups.	34 participants from 24 different organizations.	Aspects of resident care affected by EHR use: increased accessibility to information; more time to spend on care; increased retention of staff; supervisors more able to monitor care provision and care needs. Not relevant for this review: barriers to EHR implementation, and factors promoting EHR adoption.
Cherry et al. (2011) United States	To explore early users' experiences with EHR in long-term care facilities.	Exploratory study. Semi-structured interviews and observations with staff, residents and family members.	Interviews (n = 70) and observations (n = 10) across 10 nursing homes.	Largely positive experiences were described by participants from each role and divided into two themes: "care quality implication" and "cost implications."
Cherry and Carpenter (2011) United States	To determine the effect of the electronic medical record system on work process efficiencies in a long-term care facility.	Pre–post intervention study. Process flow analysis measured through observation of five working processes.	Observations (n = 20) from one long-term care facility.	The number of steps required to complete four out of the five working processes decreased post-implementation of the EMR. However, there was an increase in the number of steps for the resident admission process.
Faxvaag et al. (2011) Norway	To examine experiences of healthcare professionals when using access control mechanisms as part of EHR systems in nursing homes and hospitals.	Exploratory study. Questionnaire administered to healthcare staff in nursing homes and hospitals.	29 nursing homes with a response rate of 43% (n = 239). Not relevant for this study: 21 hospitals with a response rate of 15% (n = 206).	60% of respondents believed that it took too long to log-in. Subsequently, staff do not regularly access records before delivering care, and frequently communicate information verbally.
Filipova (2013) United States	To determine the levels of automation for 21 clinical functions, and the benefits and barriers to electronic health records use in skilled nursing facilities.	Evaluation study. Cross-sectional survey.	Response rate was 39% (n = 156).	Top three benefits of EHR use: improved quality patient care monitoring; improved management control of performance; anywhere/anytime access to charts and clinical data. Not relevant for this study: levels of clinical function automation; automated clinical decision support; automated systems for summary reports; barriers to HIT use.

(*Continued*)

Table 2. (Continued).

Authors, date, country	Aims	Study design and methods	Sample size	Results
Florczak et al. (2012) United States	To rate the ease of use and wound management effectiveness of an electronic point-of-care wound documentation system.	Prospective study. User satisfaction surveys administered to nurses at the start and end of the 2-month study. Observations of residents with pressure sores over two months.	Observations (n = 38) in one nursing home. Survey response rate (n = 9).	Documentation was found to be complete, consistent and legible. Internal and external communication improved, and physicians could easily review wound healing. Managing changes and treatment of wounds was more effective. Little change was seen in the prevention of avoidable wounds.
Fossum et al. (2013) Norway	To investigate the effects of a computerized decision support system and an educational program on care planning for pressure ulcers and malnutrition.	Comparative study. The first intervention group was trained in using the CDSS and took part in an educational program. The second intervention group only took part in the program. The third group was a control group.	150 resident records from 15 nursing homes were audited before, and 141 audited 8 months after the intervention was introduced.	The documentation from the first intervention group was more complete in recording the risk and prevalence of pressure ulcers and malnutrition.
Jiang et al. (2016) Australia	To examine the influence of EHR in managing risks and meeting the accreditation standard for information systems in Australian residential aged care homes.	Content analysis of aged care accreditation reports.	2754 reports.	One home using EHR and 12 using paper-based records failed to meet one or more accreditation outcomes. 9 out of these 12 homes failed the accreditation outcome for information systems.
Lindner et al. (2007) United States	To develop and test an electronic medical records intervention to improve documentation of patient preferences about life-sustaining care, detail of resuscitation and treatment-limiting orders.	Prospective before–after intervention trial.	224 admissions to one nursing home.	The intervention with computerized clinician order entry and reminders increased the rate of completion of advanced directive discussion notes from 4% to 63%. Treatment-limiting orders were often more detailed and 98% in accordance with patient preferences.
Marier et al. (2016) United States	To investigate whether data from EMR can improve predictive power for falls in comparison to more common models using only the minimum data set.	Comparative study. Application of a repeated events survival model to analyze MDS and EMR data.	Data from 5129 residents in 13 nursing homes were analyzed.	Incorporating EMR data improves the ability to identify those at highest risk for falls relative to prediction using minimum data set data alone.
Meehan (2015) United States	To examine the end user's perspective of an EHR in a LTC setting, and to understand how this technology is being used.	Descriptive qualitative study. Interviews with care staff.	Interviews (n = 20) in one LTC facility.	Three themes emerged from the interviews: EHR has a positive impact on quality of care; staff members have innovative ideas on how to improve EHR for current and future use; ongoing staff training for EHR is crucial.

(*Continued*)

Table 2. (Continued).

Authors, date, country	Aims	Study design and methods	Sample size	Results
Michel-Verkerke and Hoogeboom (2012) Netherlands	To measure the adoption and the suitability of an EPR for the nursing home environment.	Evaluation study. Questionnaires to evaluate the implementation of the EPR, and semi-structured interviews with end users one year after implementation of the EPR (phase I) and 4 years after (phase II).	Response rate for questionnaires was 38% (n = 130).	In phase I, the greatest advantages reported were: availability of information at any time, by all care providers; and readability. Nurses did not think that EPR gave them more time for direct care. Physicians were the least satisfied with EPR. In phase II, nurses were positive about the EPR and reported that they spent less time using it. Disadvantages remained, such as lack of EPR access in residents' rooms.
Munyisia et al. (2011) Australia	To explore care staff's perceptions about the quality of information and benefits when using an electronic system for documentation.	Comparative study. Questionnaires administered 3 months before and 6, 18, and 31 months after the introduction of an electronic documentation system in one nursing home. Structured interviews with staff conducted at 20 months.	Response rates: 64% (n = 32) at 3 months; 50% (n = 25) at 6 and 18 months; 50% (n = 15) at 31 months. Structured interviews (n = 17).	Participants perceived electronic documentation to be more accurate, legible and complete, but not more reliable or relevant than paper-based documentation. Managers reported that the electronic system had led to improved access to records and made it easier to identify care needs and outcomes.
Munyisia et al. (2014) Australia	To examine the effect of an EHR system on registered nursing and care staff's time.	Comparative study. Observations of staff two months before and at 3, 6, 12, and 23 months following the introduction of an EHR system.	Observations (n = 242) in one nursing home.	Time that registered nursing staff spent on documentation increased significantly, whilst time spent on verbal communication decreased. There was no change in the time spent on direct care. For care staff, there was no significant change in the time spent on documentation, verbal communication and direct care.
Rantz et al. (2010) United States	To explore the impact of a bedside EMR and onsite clinical consultation on cost, staffing, and quality of care in nursing homes.	Comparative study. Group 1: implemented bedside EMR and onsite consultation. Group 2: implemented bedside EMR only. Group 3: implemented onsite consultation only. Group 4: did not implement either intervention.	Group 1: 4 facilities, 2066 residents. Group 2: 4 facilities, 3643 residents. Group 3: 5 facilities, 1040 residents. Group 4: 5 facilities, 1417 residents.	Impact on staff retention: no change in any group. Impact on resident outcomes: improvement trends were found solely in group 2 for decline in late loss activities of daily living (ADLs), and decline in range of motion. Larger and more sustained improvements in pressure sores seen in groups 1 and 2 compared to groups 3 and 4. Not relevant for this study: impact on costs.

(*Continued*)

Table 2. (Continued).

Authors, date, country	Aims	Study design and methods	Sample size	Results
Rantz et al. (2011) United States	To evaluate if and how the use of a bedside EMR improves the quality of care provision and the reliability and accuracy of nursing home quality measures.	Evaluation study. Interviews, focus groups, and collection of observational data at 6, and 12–18 months after implementation of the EMR. Additional interviews at 24 months.	Focus groups (n = 22) and interviews (n = 120) in four nursing homes.	Benefits: increased accuracy; faster access to information; improved communication; ability to see trends; alerts which direct staff to appropriate care; increased accountability; some staff reported documentation time decreased. Disadvantages: some staff reported the EMR limited time spent with residents; documentation not always taking place at point of care; assessment documentation too lengthy or limited; iButtons inconvenient.
Wang et al. (2013) Australia	To describe assessment documentation practices in residential aged care homes, and to compare the quality of electronic and paper-based assessment forms.	Comparative audit study. Paper and electronic assessment forms were audited and evaluated for their quality and content.	Paper assessment forms (n = 2299) and electronic assessment forms (n = 6997) from three residential aged care homes.	All electronic resident records contained assessment forms; 9% of paper records did not contain any assessment forms. There was no significant difference in the completeness or timeliness of admission assessment forms. Ongoing paper assessment forms were found to be more complete, but less comprehensive.
Wang et al. (2015) Australia	To describe care plan documentation practice in residential aged care homes and to compare the quality and quantity of electronic and paper care plans.	Comparative audit study. Paper and electronic care plans were audited for quantity and quality.	Paper care plans (n = 111) and electronic care plans (n = 194) from seven residential aged care homes.	The electronic care plans were found to have a lower quality score than the paper care plans. Electronic care plans were found to document more information about signs and symptoms of residents' problems, but less information in relation to problem/diagnosis statements, contributing factors, resident outcomes and interventions.
Yu et al. (2008) Australia	To examine caregivers' experiences of using electronic documentation systems.	Comparative study. Semi-structured interviews and questionnaires administered to caregivers in one home using an electronic system, and one home using paper-based records.	Interviews (n = 12). Response rate of questionnaires: 82% (n = 14) at the electronic site; 43% (n = 10) at the paper-based site.	Participants using the electronic system were happy with the design, legibility, accessibility, and documentation speed, but unhappy about the time it took to log-in and -off and for synchronization. Participants using the paper records were unhappy with illegible handwriting and double data entry, and found it difficult to retrieve information.
Yu et al. (2013) Australia	To explore the unintended adverse consequences following the introduction of EHR in residential aged care homes, and to investigate the causes of these adverse consequences.	Exploratory study. Semi-structured interviews with staff at two data points after the introduction of the EHR system.	Interviews (n = 110) at nine residential aged care facilities.	Eight categories of adverse consequences were identified. These were linked to the nature of the EHR system, the way in which EHR had been implemented and used by staff, and the initial conditions.
Zhang et al. (2012) Australia	To explore the benefits of EHR in residential aged care homes and to investigate how these benefits have been achieved.	Exploratory study. Semi-structured interviews with staff at two data points after the introduction of the EHR system.	Interviews (n = 110) at nine residential aged care facilities.	Care staff identified three categories of benefits: for care staff, residents, and residential aged care facilities.

each resident's record individually to chart information as opposed to using one paper chart for all residents.[37] In one home, the reporting of incidents required staff to document information into the electronic record and into a separate software system, increasing overall time spent on incident reporting.[35]

Accountability

Documented evidence of care is essential for managers to "assess whether care [...] was professional, safe and competent."[13] In four studies, senior staff highlighted that they are more able to monitor the quality of care provision with an electronic documentation system.[5,19,31,34] Electronic documentation also enables managers to identify "patterns and trends in care needs and evaluate outcomes of care,"[13] increasing their knowledge about the current health status of residents in their homes.[5,19] However, in a study by Yu et al.,[37] participants stated that they were not able to easily generate trends from data and require an application that could automatically produce graphs and generate reports. As regards to external audits, staff found that they were able to record the minimum data set (MDS) more accurately with EHR.[38] Furthermore, electronic records make it easier to extract relevant information from documentation, allowing inspectors to carry out the audit process with "greater consistency and regularity."[19]

One study described the use of iButtons, a device designed to increase accountability, which the staff found "inconvenient and bothersome."[38] iButtons should be worn by residents and staff, and allow for the "verification of caregiver activities" at the point of care.[38] However, in the home in this study, residents were often found not to be wearing iButtons and staff had to search for them, causing delays in the documentation, and showing the incorrect time for care delivery. Furthermore, when residents were wearing the iButtons, staff felt that touching the buttons disturbed them. Participants from this study also expressed concern that the increased monitoring of care delivery was making them feel "watched." Although others believed that monitoring would lead to their work being "recognized."[38]

Assessment and care planning

Across several studies, caregivers' perceptions of using electronic documentation for assessment and care planning were positive.[5,19,33] Staff believe that some electronic assessment templates are more thorough as they provide prompts to identify potential problems,[19] whilst also guiding nurses "through body systems."[19] Participants in the study by Zhang et al.[5] noted that the interface for assessments popped up as soon as a staff member logged in, which enabled them to start with the task as quickly as possible. As regards to advance directives, an electronic intervention implemented into an EHR, designed to encourage documentation of patient wishes regarding life-sustaining care, increased the rate of advance directive discussion notes significantly.[39] This was linked with improved accessibility to this section of the care plan as the link was "uniformly placed" within notes, appearing at the top of the patient order list and labeled "code status."[39]

Staff from one study also felt that electronic documentation facilitated the writing of care plans because they are more able to access assessment forms and other relevant information and "think more critically" when developing a care plan.[5] In particular, staff appreciate being able to switch between documents and copy and paste information.[5] Using laptop computers that contain resident information during care planning meetings is also beneficial.[32] Furthermore, participants widely reported that electronic systems generate more accurate, complete, consistent, and legible information than paper records[5,13,14,19,31,33–36,38] and highlighted that their quality does not deteriorate over time like paper records.[5]

However, several studies indicated that electronic documentation systems may not necessarily facilitate care planning and assessment.[13,37,38,40–42] For example, Wang et al.[42] carried out an audit

study with results suggesting that electronic care plans provided less information about resident diagnosis and outcomes than paper-based records. However, this lack of information was linked with a possible issue with the wording of the data fields, which did not encourage nurses to "formulate diagnosis statements."[42]

Other sources of frustration included having to enter unnecessary information, but not having space in data fields for free text.[35,37,38] Furthermore, staff found that necessary forms were missing from the system.[37,38] In one study, frustrations with unsuitable electronic forms led staff to using shortcuts; in this case, documenting data in free text as opposed to using the forms. However, this meant that information was not standardized and prevented the automatic population of data into reports for trending purposes.[38] Suggestions for improvements to systems included a function where staff could enter a keyword and jump to the right section in a resident's notes, and care plans that could be automatically generated from assessment data.[5,36,37]

Exchange of information

There were mixed results as to whether electronic documentation facilitated an exchange of information. Issues with external communication were described in one home where staff were restricted from accessing the electronic hospital records of patients who were about to be discharged from the hospital to their nursing home. This meant that hospital staff would fax or send printed hardcopies of electronic records, which were often incomplete, causing time to be lost in contacting the hospital to clarify information.[35]

Munyisia et al.[13] also found that staff did not believe that the introduction of an electronic documentation system had improved communication within the home. This could be linked to slow log-in processes, which in a separate study led staff to avoid recording information electronically.[9] However, staff may also be reluctant to change their established means of communication. In two studies, participants reported that they preferred to communicate information about residents verbally within the home.[5,37] Moreover, in one study where there had been a reduction in face-to-face communication, staff were concerned about losing "a sense of belonging."[37]

Positive ways in which electronic documentation facilitates an exchange of information within the nursing home include the instant availability of records,[5,36] which is particularly helpful for staff who have been on leave and need to catch up on notes quickly.[5] Furthermore, it allows for immediate access to initial resident assessments so that "correct care" can start straight away.[5] Electronic documentation systems may also facilitate an exchange of information outside of the home. In one study, it was described how a camera built into the electronic device allowed staff to take photos of wounds.[33] These photos could be uploaded to residents' records and accessed by external healthcare providers who could then make a remote diagnosis or clinical decision. Staff also found that they could communicate better with physicians[38] and provide more detailed information to families due to the immediate accessibility of records through an electronic system.[19,32]

Risk awareness

The comprehensive and standardized nature of electronic records are reported to increase the "visibility" of changes in health,[35,38] allowing senior staff to "more quickly identify resident care needs."[31] Particularly valuable are applications that can trend clinical problems and produce alerts about new resident events, which direct staff to provide appropriate care.[19] For example, in one study, improvements were seen in both the decline of range of motion and in high-risk pressure sores following the implementation of a bedside EMR, which prompted required care.[43]

An electronic wound documentation system as investigated by Florczak et al.[33] was also found to more effectively manage treatment of wounds, promote healing, and enable staff to better recognize changes in wounds. However, nurses did not feel that the system had a significant influence on preventing avoidable wounds from initially occurring, although the authors note that this may be linked to staff not fully

implementing the "risk functionality" element.[33] Likewise, in another study, alerts were not always utilized, and furthermore, the importance of updating alerts with "best practice information" was highlighted.[38]

Two studies specifically described the effect of a computer decision support system (CDSS) embedded in an electronic system. Fossum et al.[44] found that documentation completed by staff in the intervention group using a CDSS was significantly more complete and comprehensive in recording "the risk and prevalence of [pressure ulcers] and malnutrition." However, it should be noted that this group were exposed to two simultaneous interventions. In a separate study, Alexander[15] found that alerts produced by a CDSS to warn staff about "potential skin breakdown" did not lead to a significant increase in the recording of clinical responses in most types of documentation, except for turning and repositioning charts for residents.

Data from electronic records may also increase the prediction of fall risk in comparison to data from the MDS alone, linked with the "increased frequency with which EMR data are updated" in comparison to MDS data.[45] Another possible benefit of an electronic documentation system is the ability to manage behavior more effectively.[5] In one study, staff described how due to the improved accessibility of information they were more able to "analyse common occurrences of certain undesirable behaviours" and understand why they may have occurred.[5] This allowed staff to avoid potential triggers when interacting with residents, reducing incidents of undesirable behaviour.[5]

Person-centered care

In the study by Zhang et al., staff reported that electronic documentation facilitated person-centered care as they were more able to access information about an individual's past, as well as their current needs, which gives a "broader and more holistic view" of an individual.[5] The electronic record system also allowed for the storage of photos of residents, which new staff found to be a helpful tool for learning residents' names, and access to additional information provided new staff with a topic of conversation for when they met with residents for the first time.[5]

Meehan[35] reported that staff in one home found it difficult to share discharge plans and care instructions with those patients and their families who were only in the home for rehabilitation purposes. They suggested that the introduction of a portable device would act as a tool to take into resident's rooms and visually show the patient their care plan, as well as web tutorials relating to relevant aspects of care provision.[35] Participants from the same study also believed that mobile devices would allow them to have improved access to vital information about a resident's needs, for example allergies, which is particularly important for those individuals who are only staying in the home for a short time, or for staff who work infrequently in the home.

Discussion

This integrative review has explored the ways in which EPR is facilitating or hindering care provision in nursing homes. The results of this review suggest that EPR may have the potential to assist staff in the provision of care in nursing homes. However, results have also highlighted that in order for this to occur there are certain requirements that should be considered as regards to the type of device and applications used for electronic documentation, as well as the functionality, structure, and content of EPR. These are summarized in Table 3 and subsequently described.

Device and applications

A number of studies in this review highlighted the importance of technology that can be accessed at the point of care.[22,33,36,37] This echoes results from a study by Chau and Turner,[46] who explored nursing home staff's experiences with using mobile, handheld technology. They found that the quantity and quality of documentation improved with the use of a mobile device, and that documenting information at the point of care was less time-consuming. Furthermore, in this review,

Table 3. EPR facilitators for care provision.

Device	Applications	Structure and content	Functionality
Portable device or device that is accessible at the point of care Camera embedded into portable device Devices should not disrupt residents or invade their privacy	Spellcheck Copy and paste function Keyword search button Rapid, secure log-in	Use of standardized nursing language Include the necessary forms Space for free text Structured templates that guide staff through body systems Accessible links to important documents Space to collect detailed resident history Space to upload photos	Interoperable Alert staff to create or update a new document Alert staff to changes in resident's conditions and prompt correct care (CDSS) Automated generation of care plans from assessment data Automated generation of graphs to show trends in data

portable devices were described as particularly useful for providing person-centered care.[5,35] However, as found by Rantz et al.,[38] introducing devices for bedside documentation has the potential to create burdensome expectations for staff, and as a result, they may be reluctant to record documentation. Another device considered burdensome by staff was iButtons.[38] Although this device promoted accountability, developers should also take into account that devices do not disturb or invade residents' privacy, or make staff feel watched.

Florczak et al.[33] highlighted the benefits of portable devices with cameras that enable staff to take photos of wounds, which can easily be shared with relevant external healthcare providers, who can then suggest appropriate care. As regards to applications for EPR systems, a spell check, a copy and paste function, as well as a function to enter a keyword to search for specified information within records were all identified as saving staff time.[5,36,37] Secure log-in processes should also allow for quick access to records so that staff are not prevented from accessing information prior to care delivery.[9]

Functionality

Munyisia et al.[22] argue that electronic documentation systems should act as more than "a repository of information" and prompt staff about changes in residents' condition. A CDSS embedded into a system may be useful in alerting staff to potential risk factors and enable them to provide the correct care accordingly. However, the two studies used in this review that explored CDSS did not conclusively support such an application for increased documentation of clinical responses[15] or improved documentation of ulcer and malnutrition-related assessments and interventions.[44] Furthermore, it is important that alerts are consistently updated in line with good clinical practice in order to support evidence-based practice in nursing homes,[44] and that the CDSS is user-friendly.[47] Participants also thought that alerts that prompt staff to create or update a document would be useful and highlighted the need for the EPR to generate care plans from assessment data, as well as to create graphs from data to produce trending reports.[37]

Another common requirement identified across the studies was the need to be able to share and access information externally.[33,35,38] The transferability of information is particularly important in the long-term care sector as patients are frequently transferred from hospitals to nursing homes and effective transitions of care are required.[48] The lack of ability to share information across care providers has been described as "the largest limitation factor" of electronic records.[49] Widely introduced in Canada, interoperable EHRs are "a secure consolidated record of an individual's health history and care, designed to facilitate authorised information across the care continuum."[50] Ensuring interoperability of future EPR systems is particularly important as information gaps in long-term care have been shown to have consequences for patients, clinicians, and the healthcare system.[48]

Structure and content

One of the principal reasons for the introduction of electronic records was to improve the quality of documentation, specifically assessments and care plans.[13,42] However, Wang et al.[42] found that staff were documenting less information relating to the nursing problem and resident outcomes. This was linked to possible flaws in the language used to prompt staff to record information. Furthermore, a lack of appropriate forms meant that staff in one study were found to be adding notes in free text, preventing the automatic population of data into reports.[38] Therefore, as well as including the appropriate forms for the environment, developers should ensure systems allow for a structured form of data entry with "formalised nursing language,"[42] which will also mean that decision-making tools can be successfully integrated into EPRs.[26]

Nurses also identified the importance of structured templates for assessment purposes[19] and links to important documents that should be accessible and "uniformly placed."[39] In addition, the EPR should allow for the detailed collection of information about a resident's background. Such information was highlighted as being particularly important for new staff whilst they are becoming acquainted with residents,[5] but may also act as a useful source of information for staff who work infrequently in the home. Furthermore, person-centered care is an integral part of dementia care,[51] and access to a detailed history may improve staff's understanding of a resident's behavior and how to respond appropriately.[5]

Limitations

Limitations of this study include the nature of integrative reviews, which are complex due to the way in which they combine studies with diverse methodologies, potentially leading to bias.[23] This study has used the PRISMA guidelines[29] in order to increase transparency and reduce bias. However, the synthesis of qualitative and quantitative research is a developing area and currently lacks explicit guidance.[52] Restrictions to articles in either English or French may have meant some studies were not included, and as Google Scholar was not used in the search, additional gray literature may have been missed, which could have provided a wider insight into the topic. Finally, a number of issues relating to implementation of EPR were raised in many of the articles used in this research. However, this review has not focused on these issues as they have been described in detail in numerous other studies.[21,53,54]

Conclusion

One of the principal reasons for the introduction of EPR into nursing homes was to assist staff to provide care.[6,7,41] However, findings of this review have shown that several aspects relating to the EPR system are hindering care provision in nursing homes, and that consideration should be given to numerous factors linked to the device, applications, structure, content, and functionality. Within the literature used for this review, there were some references to the technology that staff are currently using to document information electronically, as well as suggestions for modifications to existing technology that would increase usability. However, more research is required to identify the optimal characteristics of an EPR system for use in a nursing home environment, and in particular, research that focuses on the end user's experience of EPR.

Author contributions

K.S., I.H., and O.S. devised the topic for this review. K.S. and M.S designed the search strategy and carried out data collection, and K.S undertook data synthesis, analysis, and writing of the manuscript. All authors were involved in revising the manuscript and approved the final version.

Conflict of interest statement

The authors declare that they have no conflict of interest.

Funding

The research presented in this paper was carried out as part of the Marie Curie Initial Training Network (ITN) action, H2020-MSCA-ITN-2015 under grant agreement number 676265; CVUT grant SGS16/231/OHK3/3T/13; the AZV research project of the Ministry of Health 15-32942A-P09.

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